JDBC

1. Introduction to JDBC

- Overview of JDBC
- JDBC Architecture
- JDBC Drivers:
    - Type 1: JDBC-ODBC Bridge Driver
    - Type 2: Native-API Driver
    - Type 3: Network Protocol Driver
    - Type 4: Thin Driver
- Setting up a Development Environment
- Introduction to SQL (Optional: For beginners)

---

2. Establishing a Database Connection

- Loading the Driver Class
- Establishing a Connection using `DriverManager`
- Handling Database URL formats
- Closing the Connection
- Connection Pooling

---

3. Working with JDBC Statements

- **Statement Interface:**
    - Creating and Executing SQL Queries
    - Executing DDL (CREATE, DROP) and DML (INSERT, UPDATE, DELETE) Statements
- **PreparedStatement Interface:**
    - Creating and Executing Parameterized Queries
    - Batch Processing with PreparedStatement
    - Preventing SQL Injection
- **CallableStatement Interface:**
    - Working with Stored Procedures
    - IN, OUT, and INOUT Parameters

---

4. ResultSet and Data Retrieval

- Using the `ResultSet` Interface
- Retrieving Data from ResultSet

- Navigating through ResultSet (`next()`, `previous()`, `absolute()`, etc.)
- Working with ResultSetMetaData
- Updating Data in ResultSet (Using `updateRow()`)
- Scrollable and Updatable ResultSets

---

5. Handling Transactions in JDBC

- Understanding Transactions
- Auto-commit mode
- Commit and Rollback
- Savepoints
- Managing Transactions with JDBC
- Batch Updates and Transaction Management

---

6. Handling JDBC Exceptions

- JDBC Exception Handling Mechanism
- Using SQLException and SQLWarning
- Understanding Error Codes and SQLState
- Best Practices in Exception Handling

---

7. Advanced JDBC Features

- Connection Pooling with DataSource
- RowSet Interface and its implementations:
  - JdbcRowSet
  - CachedRowSet
  - WebRowSet
  - FilteredRowSet
  - JoinRowSet
- Batch Processing and Batch Updates
- Large Objects (LOBs): BLOB, CLOB
- Retrieving Auto-generated Keys
- Working with Database Metadata (DatabaseMetaData & ResultSetMetaData)
- Stored Procedures and CallableStatements

---

8. Integrating JDBC with Applications

- JDBC in Web Applications (Servlets, JSP)
- Connection Pooling in Web Applications (using Apache DBCP, C3P0, HikariCP, etc.)
- Spring JDBC and ORM (Optional: Basic Overview)

---

9. Best Practices and Performance Tuning

- Best Practices in JDBC Programming
- Optimizing JDBC Performance
- Handling Connection Leaks
- Using PreparedStatements Effectively
- Debugging and Logging SQL Statements

---

10. Practical Implementation and Projects

- CRUD Operations using JDBC
- Developing a Console-based JDBC Application
- Developing a Simple Web-based Application with JDBC
- Integrating JDBC with MVC Frameworks (Spring, Struts)
- Project Work: Build a small application using JDBC